STRUCTURE OF SPINDLE

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to a spindle for use in a mover and, more particularly, to such a spindle that prevents splashing of released lubricating oil over the outside of the mover.

2. Description of the Related Art:

Following fast development of electronic technology and mechanical technology, a variety of compact and high-power high-tech devices have been developed to improve the life of human beings. These high-tech products are the combination of semiconductor chips and precision mechanical mechanisms. During operation of these high-tech products, much heat energy is produced, and these high-tech products may fail if heat energy is not quickly carried away. Therefore, cooling fans are commonly used in these high-tech products to dissipate heat.

FIG. 1 shows the operation of the mover of an electric device, for example, a cooling fan. As illustrated, the mover **10** comprises an oil bearing **14**, a spindle **12** mounted in the oil bearing **14**, and a fan blade **18** fastened to the top side of the spindle **12**. The oil bearing **14** is sintered from metal powder to increase oil retaining force. The peripheral and bottom sides of the oil bearing **14** are blocked, preventing leaking of lubricating oil. During

operation of the mover **10**, lubricating oil is released from the oil bearing **14** to form an oil film within the inner diameter of the oil bearing **14** and the periphery of the spindle **12**. However, because the top side of the oil bearing **14** is not well blocked, released lubricating oil tends to be forced out of the top side of the oil bearing **14** to contaminate the surroundings or to wet the surrounding circuits, causing a short-circuit. When the mover **10** failed, heat cannot be quickly carried out of the electronic apparatus, and the electronic apparatus may be caused to shut down, or may be damaged by heat.

Therefore, it is desirable to provide a spindle that eliminates the aforesaid problem.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. It is the main object of the present invention to provide a spindle, which prevents splashing of lubricating oil from the oil bearing. It is another object of the present invention to provide a spindle, which effectively retains lubricating oil released from the oil bearing. To achieve these and other objects of the present invention, the spindle is mounted in an oil bearing inside a mover and adapted to rotate a follower member, having a plurality of oblique guide grooves formed on and arranged around the periphery and adapted to guide lubricating oil released from the oil

bearing toward the bottom side, preventing splashing of released lubricating oil over the outside of the mover.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic drawing showing lubricating oil splashed out of the gap in the top of a mover according to the prior art.

FIG. 2 is an elevational view of a spindle made according to the present invention.

FIG. 3 illustrates the spindle used in a mover according to the present invention.

FIG. 4 is an elevational view of an alternate form of the spindle according to the present invention.

FIG. 5 illustrates the alternate form of spindle used in a mover according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 2, a spindle **22** is shown having a plurality of oblique guide grooves **24** formed on the periphery. The oblique guide grooves **24** are spaced from one another at a gap and arranged around the periphery of the spindle **22**.

Referring to FIG. 3, the spindle **22** is mounted in the oil bearing **26** of a mover **20** inside an electric apparatus, for example, a fan (not shown). The top end of the spindle **22** is fastened to a fan blade **28**. During rotary motion of the spindle **22**, the sloping guide

grooves **24** give a downward thrust force to lubricating oil released from the oil bearing **26**, preventing splashing of lubricating oil out of the gap in the top side of the mover **20**, and smoothening downward flowing of lubricating oil. Therefore, sufficient lubricating oil is retained to the gap in between the inner diameter of the oil bearing **26** and the periphery of the spindle **22** during rotary motion of the mover **20**, preventing overheat of the mover **20**.

The sloping direction of the oblique guide grooves **24** on the periphery of the spindle **22** is determined subject to the designed direction of rotation of the spindle **22**. The sloping angle and the number of the oblique guide grooves **24** are determined subject to the designed maximum speed of rotation.

As indicated above, the formation of the oblique guide grooves on the periphery of the spindle prevents an overflow of lubricating oil during the rotary motion of the mover, and enables an oil film of certain thickness to be easily established between the oil bearing and the spindle to reduce possible friction and to further improve the performance of the mover and prolongs its service life.

FIGS. 4 and 5 show an alternate form of the present invention. According to this embodiment, the spindle **22** has two sets of oblique guide grooves **24** respectively formed on the periphery and arranged around the periphery at different elevations.

The oblique guide grooves **24** can be simultaneously formed on the periphery of the spindle **22** during casting of the spindle **22**. Alternatively, the oblique guide grooves **24** can be formed on the periphery of the spindle **22** through a secondary processing process.

A prototype of structure of spindle has been constructed with the features of FIGS. 2~5. The structure of spindle functions smoothly to provide all of the features discussed earlier.

Although particular embodiments of the invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.